SERIES 5000

General Information

Typical Series 5000 Module Arrangement. NEMA Type 1 enclosures can be mounted in standard 19-inch racks.

The use of MICROPLEX® Series 5000 Remote equipment in a Supervisory Control and Data Acquisition system eliminates practically all restrictions on numbers and types of points per Remote, physical location, packaging, and the general configuration and distribution of the Remotes. Most important, a Series 5000 Remote can be easily expanded or modified at any time after installation in order to acommodate additional requirements. . . whether originally planned for, or unforeseen.

These and many other benefits, including new standards of performance and reliability, are made possible by an unprecedented application of modular concepts and the maximum use of established industry-wide standards.

By designing Series 5000 modules for compliance with applicable standards in the areas of data communications, power system control, and electrical and electronic equipment packaging, a straight-forward system architecture has been developed which is economical, easy to maintain, and which provides the utmost degree of reliability and security.

The central element in a Series 5000 remote is a Common Control module which contains the basic intelligence for that Remote. Completely self-contained in a NEMA Type 1 enclosure, the Common Control module interconnects with various point function modules and a Communication module through standard EIA RS-232-C data ports. These ports — a key element in the Series 5000 concept — allow Remote station expansion by simply plugging a point module into a data port. Such additional point capability, once interfaced to the customer's equipment, can be added and brought on-line without the need to power down the Remote.

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Standardizing on the EIA RS-232-C interface between the Common Control and other modules makes possible many significant options, including:

a) The first stages of an expanding or changing system can be specified and installed without defining the ultimate size, capability, and configuration of the system.

b) The Common Control can accommodate modules of different point capacity, various data rates, and having other functional capabilities.

c) Point modules can be located up to 500 feet from the Common Control (or, using modems, at any distance).

d) Series 5000 Remotes allow a straightforward, standard interface with a local computer.

Series 5000 Modules

Each Series 5000 module adheres to strictly defined functional, electrical, and mechanical specifications. Complementary metal oxide-semiconductor logic (CMOS) is used extensively to reduce power requirements and minimize heat dissipation. Large-scale integrated circuitry reduces parts count and enhances reliability.

A typical Series 5000 Remote Station consists of one Common Control module, one Communication module, and one or more Point modules. For operation from station battery, a Power Supply module is also required.

Intermodule Communication

All intermodule communication is bit-serial via communication ports which conform to EIA Specification RS-232-C. Series 5000 modules all have 25-pin D-type female connectors, and the interconnect cables are supplied with male connectors at each end. When point modules are remotely located, maximum recommended cable length is 500 feet.

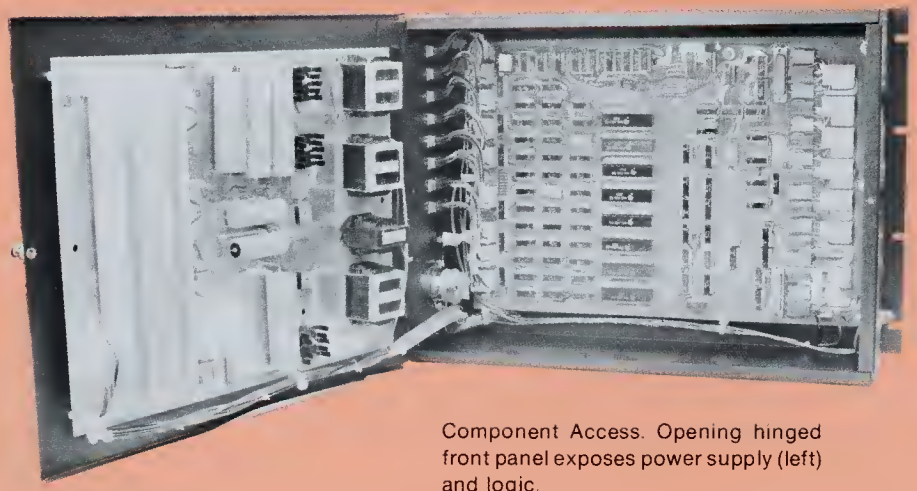
Each powered functional module requires 115 Vac, 60 Hz. The input specifications are as follows:

Power Distribution

Voltage: 115 Vac ±10% rms, 1ϕ

Frequency: 47-420 Hz

RS-232-C data port connectors on left side of Common Control enclosure.



Component Access. Opening hinged front panel exposes power supply (left) and logic.

SERIES 5000

Communication With Master Station

Series 5000 Remotes operate in a supervisory control system in **continuous scan** mode. A Series 5000 Remote includes a Communications module which is equipped with a modem for connection to the user's communication facility. This facility can be any full duplex (4-wire) or half duplex (2-wire) voice grade, telephone, microwave, or power-line carrier communications link which meets the user's requirements. The mode is always half duplex, although the use of full duplex channels reduces turnaround time, increasing the effective scan rate somewhat in higher speed applications.

The communications module is described on an individual sheet.

All communications between Master and Remotes are initiated by a service request from the Master. All messages are organized into 10-bit characters having a start bit, seven data bits, an odd parity bit, and a stop bit. The seventh data bit is set by the Master to a logical one in the first character to identify the start of a new message exchange sequence. Message exchanges are always of the following form:

MASTER TO REMOTE:

Remote Address	1 character
Opcode Command	1 character
Data (Supplemental Instructions)	0-7 characters
Error Code	1 character

REMOTE TO MASTER:

Remote Address	1 character
Response	(See individual responses)
Error Code	1 character

A chart on the reverse of this sheet lists the exchanges for each of the 11 functions currently assigned, together with the message length in characters.

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(Continued)

FUNCTION	MASTER-TO-REMOTE QUERY/COMMAND	REMOTE-TO-MASTER DATA/ACKNOWLEDGEMENT
STATUS CHANGE CHECK	Remote Address, Op Code 3, Error Control Code (3 Characters)	Remote Address, Number of Changes Since Last Scan, Error Flag Character, Error Control Code (4 Characters)
STATUS CHANGE DUMP	Remote Address, Op Code 4, Number of Status Changes to be Read Out, Error Control Code (4 Characters)	Remote Address, 2 Characters Defining Port and Point Address Plus New State for Each Status Change Read Out, Error Flag Character, Error Control Code (5-65 Characters)
STATUS UPDATE	Remote Address, Op Code 5, 'Select' or 'Skip' Character for each C & I Module, Error Control Code (4-10 Characters)	Remote Address, 6 Characters Defining Binary States of 32 Status Points for Each Selected C & I Module, 1 Error Flag Character for Each C & I Module, Error Control Code (9-51 Characters)
STATUS CHANGE CHECK AND DATA DUMP	Remote Address, Op Code 0, Number of Points to be Read Out from Each A/D or Accumulator Module, Error Control Code (4-10 Characters)	Remote Address, Number of Changes Since Last Scan, Error Flag Character for C & I Modules, 2 Characters per Data Point Read Out, Error Flag Characters for Each A/D or Accumulator Module, Error Control Code (7-459 Characters)
POWER FAILURE FLAG RESET	Remote Address, Op Code 11, Error Control Code (3 Characters)	Remote Address, Error Control Code (2 Characters)
CONTROL POINT ARM	Remote Address, Op Code 6, 2 Characters Specifying Port and Point Address Plus Desired New State of Point to be Controlled, Error Control Code (5 Characters)	Remote Address, 2 Characters Acknowledging Port and Point Address Plus Desired New State of Point to be Controlled, Error Control Code (4 Characters)
CONTROL POINT OPERATE	Remote Address, Op Code 7, Port Address of Point to be Controlled, Complemented Point Address and Desired New State of Point to be Controlled, Error Control Code (5 Characters)	Remote Address, Error Control Code (2 Characters)
SETPOINT ARM	Remote Address, Op Code 9, 3 Characters Specifying the Port and Point Addresses Plus Desired Analog Output of Point to be Controlled, Error Control Code (6 Characters)	Remote Address, 3 Characters Acknowledging Port and Point Address Plus Desired Analog Output of Point to be Controlled, Error Control Code (5 Characters)
SETPOINT OPERATE	Remote Address, Op Code 10, Port Address of Point to be Controlled, Complemented Point Address and Desired Analog Output of Point to be Controlled, Error Control Code (6 Characters)	Remote Address, Error Control Code (2 Charcters(
AGC RAISE/LOWER	Remote Address, Op Code 8, Port Address of Raise/Lower Module being Controlled, 6 Characters Stipulating Direction and Duration of Desired Raise/Lower Actions for Each of that Module's 6 Outputs, Error Control Code (10 Characters)	Remote Address, Error Control Code (2 Characters)
PORT STATUS DUMP	Remote Address, Op Code 12, Error Control Code (3 Characters)	Remote Address, 1 Error Flag Character for Each Port, Error Control Code (9 Characters)
SOE (SEQUENCE OF EVENTS) CHANGE CHECK	Remote Address, Op Code 15, Control Code (3 Characters)	Remote Address, Number of SOE changes since first scan, Error flag status and Error Control Code (4 characters)
SOE CHANGE DUMP	Remote Address, Op Code 16, number of SOE changes, and Error Control Code (4 Characters)	Remote Address, Point number, status, time, relative port number, (7—X characters)
SOE TIME REGISTER RESET	Remote Address, Op Code 13, Error Control Code (3 Characters)	Remote Address, Error Control Code (2 characters)
SOE TIME REGISTER RESET/ CHANGE QUEUE CLEAR	Remote Address, Op Code 14, Error Control Code (3 Characters)	Remote Address, Error Control Code (2 characters)

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SERIES 5000

50-0200 8-Port Common Control

50-0200 8-Port Common Control module accepts as many as seven Point modules.

The Common Control module provides the basic intelligence of the Remote station. It serves as a data concentrator, language translator, and message switching center between the Communications module and the various point modules. The Communications module then interfaces the Remote to a commercial or private communication facility, for exchange of information with the Master station; and the point modules are interfaced with the customer's equipment to implement the various types of control, monitoring, and data acquisition functions.

In order to configure a Series 5000 Remote to match a specific set of requirements, a selected combination of modules is plugged into the data ports on the Common Control. Modules are selected according to functions, sizes, and types to suit the application. Data ports are assigned to a specific type of module at the factory. Point modules can then be plugged into the Common Control at any time without interrupting system operation. Field modification is required only if a data port is to be reassigned to accommodate a module of another type.

A point module can be unplugged at any time without disturbing the operation of other modules in the Remote.

The following rules and recommendations apply to module combinations for the 8-port Common Control:

1. Data port O is reserved for a Communications module.
2. Data ports 1 through 7 are assigned to specified types of point modules at the factory.
3. Maximum cable length between a point module and the Common Control is 500 ft.; modems must be used for greater distances.

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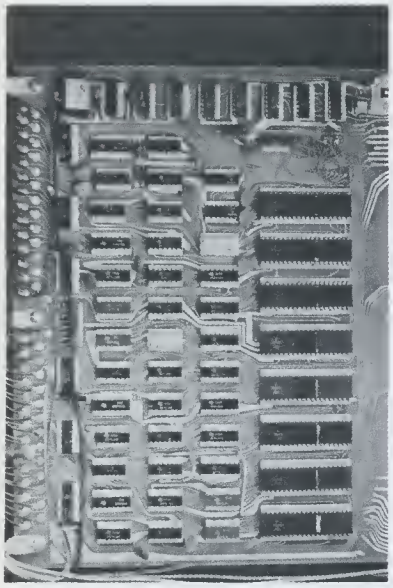
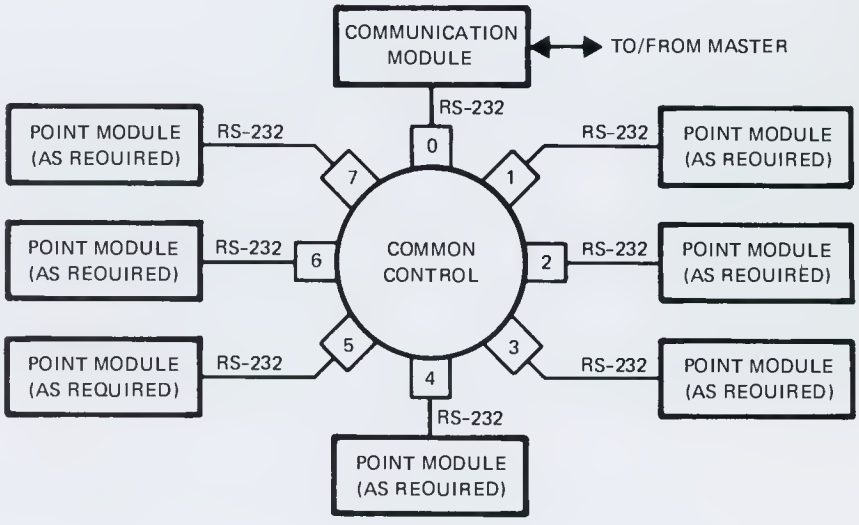
Rev. 6/81



All logic is contained on one flow-soldered PC board, fully accessible for inspection and maintenance. No card edge connectors or wire-wrap used.

Eight RS-232-C Data Port connectors and Power connector are located at left end of rack-mounting module.

Number of Data Ports	8 (one Communications module; 7 Point modules)
Transmit/Receive Line Rates	Individually selectable; 4800, 2400, 1200, 600, 300, or 150 bps. Standard line rate for ports 1—7 is 2400; Port 0 per customer requirements.
Character Format	One start bit, seven data bits, one odd parity bit, one stop bit.
Power Input	
Voltage	115 VAC ±10%
Frequency	47-420 Hz
Power	47 VA
Physical	
Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	14 lbs.



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SERIES 5000 50-0210 Communications Module

The Communications module provides interface between an RS-232-C port and a 3002 voice-grade communication channel. The interface to the communication channel is Bell 202D compatible.

Data rate is from 0-1200 BPS, using unconditioned (or better) lines. The module is capable of full duplex or half duplex operation, and can be operated with either a 2-wire or 4-wire channel. It provides a "Request to Send/Clear to Send" delay which is adjustable from 0 to 200 milliseconds to accommodate different channel turn-around times.

The Communications module operates from AC input power.

Communication Channel Interface

Line Requirements	3002 unconditioned for 0-1200 BPS
Modulation	Phase coherent FSK
Frequencies (Bell 202D Compatible)	Mark 1200 Hz ± 1.0% Space 2200 Hz ± 1.0%
Transmit Level	0 to −25 dbm, adjustable
Receive Dynamic Range	0 to -40 dbm
Impedance	600 ohms ± 10%, resistive
Mechanical Interface	Six #6 screw terminals on barrier type terminal strip. (Two terminals plus shield for transmit and receive line.)
Surge Protection	SWC test on all customer terminals

RS-232-C Interface

Xmit/Rec Line Rate	0-1200 BPS
Request to Send/Clear to Send Delay	20 to 200 msec adjustable (± 10%)

Power Input

Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	6 VA

MICROPLEX®

(Continued)

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	7 lbs.

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50-0212

SERIES 5000

Communications Module/Loopback

The Communications module with Loopback provides interface between an RS-232-C port and a 3002 voice-grade communication channel. The interface to the communication channel is Bell 202D compatible.

Data rate is from 0-1200 BPS, using unconditioned (or better) lines. The modem (identical to that used in the 50-0210 module) is capable of full duplex or half duplex operation, and can be operated with either a 2-wire or 4-wire channel. It provides a "Request to Send/Clear to Send" delay which is adjustable from 0 to 200 milliseconds to accommodate different channel turn-around times.

The Loopback system is intended for use in maintaining polled multidrop communication networks employing four-wire communication facilities designed for high speed data transmission. It consists of a Loopback Master Control Unit, normally located at the Harris Central Computer facility, and Remote Loopback Units at each of the Remote locations.

The Remote Loopback Unit is interposed between the line and the modem, and between the EIA interfaces of the modem and Common Control. With no power applied, or with the Remote Loopback Unit in its normal (or reset) condition, it is transparent to both the line and the EIA interfaces. However, it can be made to loop back the line (analog loopback) or the modem received data (digital loopback), or both alternately. It also can be made to disconnect the modem from the transmit side of the line (break). All these actions are made only in response to commands transmitted by the master unit; the remote unit itself has no external controls. Furthermore, each action is retained at the remote unit by self contained latches, and can be changed or reset only on commands from the master unit (reset), automatically by the timeout function, or by temporarily removing power.

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Communication Channel Interface

Line Requirements .....3002 unconditioned for 0-1200 BPS

Modulation .....Phase coherent FSK

Frequencies .....Mark 1200 Hz ± 1.0%
(Bell 202D Compatible) Space 2200 Hz ± 1.0%

Transmit Level .....0 to −25 dbm, adjustable

Receive Dynamic
Range .....0 to −40 dbm

Impedance .....600 ohms ± 10%, resistive

Mechanical Interface .....Six #6 screw terminals on barrier type terminal strip. (Two terminals plus shield for transmit and receive line.)

Surge Protection .....SWC test on all customer terminals

Loopback Unit

Application .....4 wire circuits only. Line connections via two two barrier strips

Addresses .....01 to 99, internally strapped.

Commands .....Four, with latches:
(a) Analog Loopback
(b) Digital Loopback
(c) Transmit Break
(d) Reset
All are controllable by tone inputs only, except that Reset also occurs if power is interrupted.

Receive Sensitivity .....Responds to tones of 0 to −45 dBm level.

Input Impedance .....>12K ohms., via a line bridging transformer

Control Method .....Remote by audio tones with error protection. Frequency range, 850 Hz to 1850 Hz (no local control possible)

Indicators .....LED type showing:
(a) Analog Loopback
(b) Digital Loopback
(c) Transmit Break

Input/Output .....All 25 EIA leads are transparent. Telephone circuits are straight through.

Input/Output Connections ...Modem—EIA 25 pin, Male Terminal—EIA 25 pin, Female Telephone—Barrier strip

RS-232-C Interface

Xmit/Rec Line Rate .....0-1200 BPS

Request to Send/Clear
to Send Delay .....20 to 200 msec adjustable (± 10%)

Power Input

Voltage .....115 VAC ± 10%

Frequency .....47-420 Hz

Power .....13 VA

Physical

Width .....19 in. (rack mounting; EIA-RS-310A)

Vertical Panel Space .....14 in.

Depth .....6-1/2 in.

Weight .....10 lbs.

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SERIES 5000

50-0220/21/22 Power Supply Modules

The Power Supply modules generate AC power compatible in electrical specifications to the AC voltage input required by the functional modules. They are designed to operate from the substation battery. The three battery input voltage options are:

Nominal Voltage	Module Model Number
125 VDC	50-0220
48 VDC	50-0221
24 VDC	50-0222

Power Supply modules generate 300 watts of AC power for Microplex Series 5000 modules. They include an earth ground bus to terminate each functional module.

The neutral and ground leads are connected to a ground bus. The chassis ground from each module is also connected to this bus which may be connected to earth ground by the customer.

DC Power Input

Mechanical Interface	Two #8 screw terminals on barrier type terminal strip
Voltage	
Model 50-0220	120 VDC ±20%
Model 50-0221	48 VDC ±20%
Model 50-0222	24 VDC ±20%
Fuse Protection	One DC circuit breaker on battery input
Surge Protection	SWC test on battery input terminals
Efficiency	40% Minimum, 70% Typical

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(Continued)

AC Power Output

Voltage	270 V ± 20 V peak to peak square wave
Maximum Instantaneous Voltage Overshoot	± 180V Peak
Frequency	100 Hz ± 20%
Power	300W Continuous Duty
Mechanical Interface	Eight sets of three each #8 screws (power, ground, neutral)

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-3/4 in.
Weight	33 lbs.

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SERIES 5000 50-0230

16-Point C/I; 16-Point Indication Logic Module

The 16-Point C/I; 16-Point Indication module contains all logic for 16 control and indication points, plus 16 additional indication points. A single self-contained NEMA 1 enclosure houses all timing and control logic, logic power supplies, customer terminal blocks for the 32 indication points, and relay drivers for the 16 control points. It is designed to drive one 50-0240 16-Point C/I Relay Module. The module is entirely solid-state. Customer status inputs are electrically isolated through optical isolation devices.

Indication Points

The module scans its own points and maintains a queue of status changes (31 changes maximum) as well as the present state of each point. When properly queried, the module reports the number of stored, unreported changes, up to 31 queue entries, or the present state of each point.

Control Points

Operating any control point requires the transmission of two messages: an Arm and an Operate command. The address and the desired state are sent with each command. The module checks for address and desired state comparison between the arm and operate messages. If they do not agree, the module takes no action. Additionally, a security circuit ensures that no more than one point is operated. In the event of an electronic component failure, no false operation is performed.

A single timer is provided to time contact closures. The timer is set at 150 msec. ± 10%.

Customer Interface

Indication Points

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips.
Customer Input	Dry Contact
Open Circuit Voltage	22 VDC± 10% (Supplied by the module)
Short Circuit Current	18 ma ± 10% (Supplied by the module)
Change of Status Detection	6 msec ± 2 msec required for detection of a change
Surge Protection	SWC Test on all customer terminals

(Continued)

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Relay Driver Outputs

Mechanical Interface	One 25-pin male connector
Current Sinking Capability	Eighteen (18) relay drivers (sixteen point drivers, one trip driver, one close driver) each capable of sinking up to 250 ma from a maximum open circuit voltage of 28 VDC.

Common Control Interface

Xmit/Rec Line Rate	9600, 4800, 2400, 1200, 600, 300, 150 BPS (2400 Standard)

Power Input

Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	37 VA

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	13 lbs.

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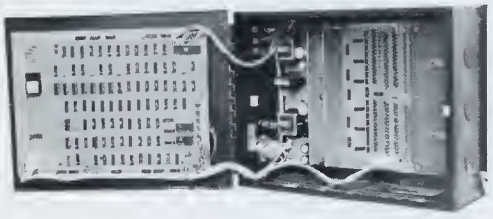
SERIES 5000 50-0235

16—Point C/I; 16—Point Indication/Sequence of Events Logic Module



Interior of module showing Logic circuitry (left) and customer interface terminals (right).

Sequence of Events Module

The "Sequence of Events" module allows the actual time of state change detection to be recorded along with the new state for selected status points on Microplex Series 5000 remotes. System-wide sorting of events by time of occurence is supported. Accommodation for communication path diversity is inherent in the design since communication time delay is determined in real-time. A two-millisecond resolution on time of state change recording is provided.

Each SOE module has the capacity to store up to 63 changes of status distributed across 32 two-state points. Storing of the 64th COS constitutes an overflow condition. Any ensuing status changes will not be stored until the module's change memory is purged (fully or partially).

The SOE module responds as a standard C&I Logic module to Common Control requests for the number of changes in the module's change memory. The SOE module also responds the same as a standard C&I Logic module to Common Control requests for transfer of a number of changes stored, or for a complete status update. In addition, the module will respond to an SOE change check the same as it does for a standard change check, except the response if based upon the contents of a separate Change memory. It will also respond to an SOE change dump the same as it does for a standard change dump except it will also include the time recorded for each change. Again, this response is associated with a separate memory.

Customer Interface

Mechanical Interface	Two #8 screw terminals per point on a barrier type terminal strip.
Customer Input	Dry Contact
Open Circuit Voltage	22 VDC ± 10% (supplied by the module).
Short Circuit Current	20 mA ±20% (supplied by the module).
Transient Protection	6 ms ±2 ms before detection of a change.
Surge Protection	SWC on all customer terminals.

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(Continued)

Relay Driver Outputs

Mechanical Interface	One 25-pin male connector.
Current Sinking Capability	Eighteen relay drivers (sixteen point drivers, one close driver, one trip driver) each capable of sinking 250 mA at an open circuit voltage of 28 VDC.

Data Interface

Interface type	EIA RS-232-C
Xmit/Rec Line Rates	2400 BAUD

Power Input

Voltage	115 VAC ±10%
Frequency	47-420 Hz
Power Consumption	60 VA

Physical

Width	19 in. (rack-mounting: EIA RS-310-A)
Vertical Panel Space	14 in.
Depth	6.5 in.
Weight	15 lbs.

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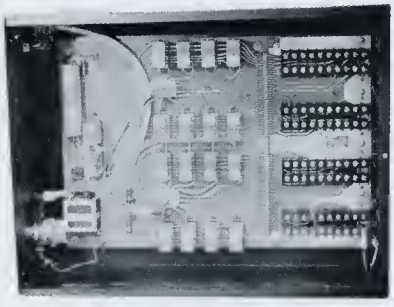
SERIES 5000

50-0240

16-Point Control Relay Module



Module interior showing relays and customer interface terminals.

The 16-Point Control Relay module includes sufficient relays and customer termal blocks for 16 control points. It is used in conjunction with the 50-0230 16-Point C/I; 16-Point Indication module. It is housed in a self-contained NEMA 1 enclosure and requires AC input power.

A control operation is performed by energizing one point relay and either the trip or the close relay. Feedback is provided at the relay contact to allow the 16-Point C/I; 16-Point Indication module to verify selection of a point and to inhibit operation of any other point.

Customer Interface

Mechanical Interface	Two #6 screw terminals per output on barrier type terminal strips.
Output	One form A dry contact per output with the following ratings:

Open Circuit Voltage	Current (Resistive Load) Max.	Min.
28 VDC	15A	.200A
52 VDC	10A	.200A
140 VDC	1.5A	.200A
120 VAC 60 Hz	10A	.200A

Surge Protection	SWC Test on all customer terminals.
Relay Coils	Eighteen relays (16 point relays, one trip relay and one close relay) each requiring 50 ma. Maximum open circuit voltage = 27 VDC.

Power Input

Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	10 VA

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	11 lbs.

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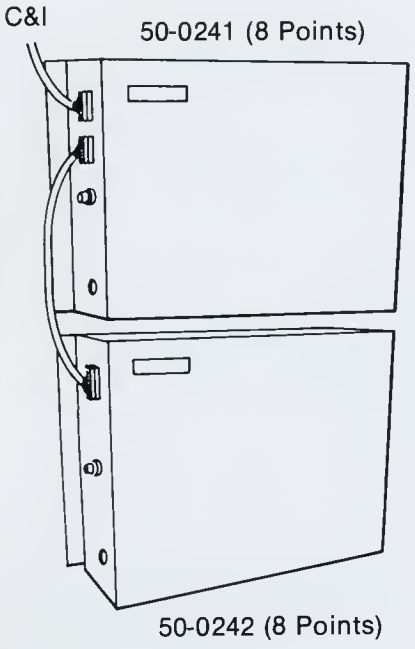
Rev. 9/76

SERIES 5000

50-0241/0242

Heavy Duty Interposer Relay Modules

Each module, as an option to the Series 5000 remote, provides 16 heavy duty contact handoffs for 8 control points in lieu of the 50-0240 16 Point Control Relay Module.



CUSTOMER INTERFACE	
Mechanical Interface	Three #8-32 screw terminals on relay per form "C" contact.
OUTPUT	Two form "C" dry contact outputs with magnetic blowout per form "C" contact.
Contact Rating	125 VDC @ 20 AMP Resistive Load (Potter Brumfield PRD-Relay).
Surge Protection	SWC test on all customer terminal interface.
POWER INPUT	
Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	10 VA
PHYSICAL (Per Module)	
Width	19 in. (rack mounting: E1A-RS-310A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	22 lbs.
ENVIRONMENTAL	
Operating Temp. Range	0°-55° C ambient
Relative Humidity	0%-95%, non-condensing

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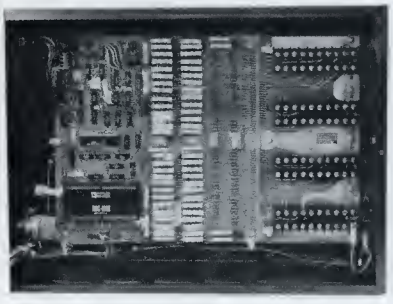
Rev. 6/81

SERIES 5000

50-0250/0252
32-Point Single Ended A/D Module

The 32-Point Single Ended A/D module accepts from one to 32 analog inputs. Upon receiving a query character on its RS-232-C port, the module digitizes each analog input, in sequence, and produces a representative serial bit pattern at the RS-232-C port. Any number of points from 1 to 32 can be requested. The module is housed in a self-contained NEMA 1 enclosure, and requires AC input power.

The 50-0252 Single Ended A/D Module is identical, except that the first two points can be implemented as reference points. The reference voltage is ± 90% F.S. The remaining points are available for customer interface in the usual manner.



Interior of module showing Logic circuitry (left) and customer interface terminals (right).

Customer Interface

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips plus one #6 screw terminal per four points for shield termination
Customer Input	± 5V or ± 1 ma
Input Impedance	5K Ohms ± 0.1%
Accuracy	± 0.2% F.S. ± 1/2 LSB
Temperature Coefficient	± .01%/1° C F.S.
Filter Frequency Response	60 db down at 60 Hz
Filter Description	Two stage, corners at .58 Hz and 4.3 Hz, 12 DB/Octave past 4.3 Hz
Input Fault Voltage	± 10 volts without damage

Common Control Interface

Xmit/Rec Line Rage	9600, 4800, 2400, 1200, 600, 300, 150 BPS (2400 standard)

Power Input

Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	20 VA

MICROPLEX®

(Continued)

Physical

Width	19 in. (rack mounting; EIA-RS-310A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	12 lbs.

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SERIES 5000

50-0251
32-Point Isolated A/D Module With Reference

The 32-Point Isolated A/D Module accepts from one to 30 analog inputs. (The first two points are reserved and implemented as reference points scaled for ±90% of full scale.) A "Flying Capacitor" type circuit is employed in the module. Upon receiving a query character on its RS-232-C port, the module digitizes each analog input in sequence and produces a representative serial bit pattern at the RS-232-C port. Any number of points, from 1 to 32, may be requested. The module is housed in a self-contained NEMA 1 enclosure and requires AC input power.

Customer Interface

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips plus one #6 screw terminal per four points to shield termination.
Customer Inputs:	
Standard	± 5 V or ± 1 ma; 5 K ohms impedance ± .05%
Optional	±20 ma; 250 ohms impedance ± .05% ± 50 ma; 100 ohms impedance ± .05%
Resolution	11 bits plus sign
Accuracy	± .185% F.S.; ± 1/2 LSB max. 0-55° C (Typical: ± .025%)
Filter Frequency Response	60 db down at 50 Hz
Filter Description	Two pole RC Filter
Input Fault Voltage	± 25 volts without damage or adjacent channel interference (48 ma on ± 20 ma inputs; 120 ma on ± 50 ma inputs)
Common Mode Peak Voltage	Up to ± 200 VDC without damage Up to 200 P/P AC without damage
Common Mode Rejection Ratio	100 db down, DC to 60 Hz
Cross Talk Between Any Two Channels	100 db from DC to 60 Hz

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(Continued)

Rev. 6/81

COMMON CONTROL INTERFACE

Xmit/Rec Line Rate	2400, 1200, 600, 300, 150 BPS (2400 standard)
Reference Points (2)	
Quantity	± 4.500 VDC, Adjustable
Accuracy	.075% over range of 0°-55° C (Typical .025%)
Power Input	
Voltage	115 VAC ± 10%
Frequency	47 to 420 Hz
Power	14 VA

PHYSICAL

Width	19 in. (rack mounting: E1A-RS-310A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	15 lbs.

ENVIRONMENTAL

Operating Temp. Range	0°-55° C ambient
Relative Humidity	0%-95%, non-condensing

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SERIES 5000 50-0255

32 Point Low-Level Analog Amplifier Module

The Low-Level Amplifier module is designed to accommodate the use of low-level transducers, which have outputs in the millivolt ranges, with analog-to-digital converters requiring a ±5 volt full scale input range.

The 50-0255 module provides from one to 32 low-level analog amplifier channels. Each amplifier can be separately scaled to accept a transducer input in the range of ±100 MV, ±50 MV, ±30 MV, or ±10 MV. The amplifiers provide outputs of ±5 V full scale, compatible with Series 5000 32-Point Single Ended Analog-to-Digital Converter modules.

The low-level amplifiers are single ended and non-isolated, and should not be used where isolated inputs are required. Use in thermocouple applications is recommended only after an engineering determination of suitability for each individual case.

Customer Interface

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips plus one #6 screw terminal per four points for shield termination.
Customer Input	±100 MV; ±50 MV; ±30 MV; or ±10 MV (other gain scaling ranges can be provided).
Input Impedance	1 Megohm ±1% per channel.

Output Interface

Mechanical	One 22 AWG twisted pair per channel, via four 25-pin connectors on module enclosure.
Electrical	±5 V compatible with a 5K ±1% load. Maximum output load current for FS output voltage at rated accuracy is ±2 ma.

Accuracy	Input Range	Low-Level Amplifier Only	Including A/D Converter
	±10 MV FSI	.2% of FS output	.4% FS ±½ LSB
	±100 MV FSI	.1% of FS output	.3% FS ±½ LSB

Temperature Coefficient	Input Range	Low-level Amplifier Only	Including A/D Converter
	±10 MV FSI	.03% of FS output per 1° C.	.04% of FS output per 1° C.
	±100 MV FSI	.0035% of FS output per 1° C.	.0135% of FS output per 1° C.

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Power Input

Voltage	115 VAC ±10%
Frequency	47-420 Hz
Power	8 VA

Physical

Width	19 in. (rack mounting; EIA-RS-310A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	10 lbs.

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SERIES 5000 50-0260

4-Point Setpoint Module

The 4-Point Setpoint module provides four separate analog outputs, corresponding to commands received on its RS-232 port. Each output can withstand up to ± 200 volts of common mode voltage.

One Form A contact set is provided for each point. The contacts close when the setpoint is updated from the Master.

The module requires two separate 4-character messages in order to change the analog output for any point. The first message, **Setpoint Arm**, specifies the point address and the required analog output. The second message, **Setpoint Operate**, must be consistent with the Setpoint Arm message for an analog output to be changed. The module takes no action if the two are inconsistent.

Customer Interface

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips.	
Output Levels (Strappable per Point)	**Output**	**Load**
	4-20 ma	0-250 Ohms
	10-50 ma	0-100 Ohms
	1-5 ma	0-1000 Ohms
	0-5 volts	0-20 ma
Max Common Mode Voltage	± 200 VDC	
Common Mode Rejection Ratio	80 db @ 60 Hz	
Accuracy	± .2% of F.S. @ 25° C	
Repeatability	± .1% of F.S. @ 25° C	
Temperature Coefficient	± 0.012% F.S./° C	
Contacts	Form A rated at 10 VA (0-200 VDC, 0-0.5A) 0.1-11 sec closure, adjustable.	

RS-232-C Interface

Xmit/Rec Line Rate	9600, 4800, 2400, 1200, 600, 300, 150 bps (2400 standard)

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(Continued)

Power Input	
Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	20 VA
Physical	
Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	14 lbs.

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50-0262

SERIES 5000

4 or 8 Point — 16-Bit Parallel Data Input Module

The 16-Bit Parallel Data Module contains four points (50-0262-1) with an option providing for an additional four points (50-0262-2). Sixteen bits of customer data is accepted from each of the points. Typical applications include Tank Gauging and monitoring BCD inputs.

The Module is completely self-contained in a 19-inch rack-mountable NEMA 1 enclosure, and operates from a 115 VAC input. An internal power supply generates the required DC voltages to power module circuitry.

Customer Interface

Mechanical ..... Barrier type terminal strips with #8 screw terminals.
Customer Input ..... Dry Contact
Open Circuit Voltage ..... 24 volts ± 10% (supplied by the Module)

Power Input

Voltage ..... 115 VAC ± 10%
Frequency ..... 47-420 Hz
Power Consumption ..... 37 VA

Physical

Width ..... 19 in. (rack mounting: EIA RS-310-A)
Vertical Panel Space ..... 14 in.
Depth ..... 6.5 in.
Weight ..... 13 lbs.

Environmental

Operating Temperature Range ..... 0°-55°C Ambient
Relative Humidity ..... 0%-95%, non-condensing

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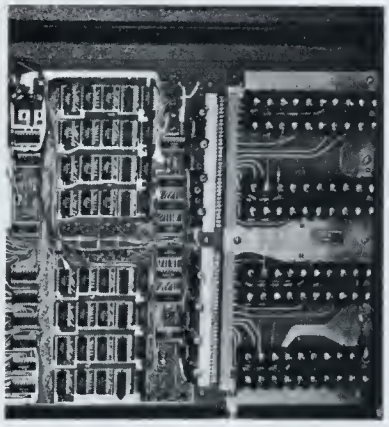
SERIES 5000 50-0270
8-Point Accumulator Module



Hinged access cover opens to provide clear access to customer interface terminal blocks.

The 8-Point Accumulator module contains eight 12-bit counters which accumulate transitions of dry contact inputs. The output from each counter may be "chained" to the next counter to provide counts above 4095. A query containing the desired number of points causes the actual counts of from 1 to 8 accumulators to be read out.

Mechanical Interface	Two #6 screw terminals per point on barrier type terminal strips
Customer Input	Dry Contact
Open Circuit Voltage	18 VDC±10% (Supplied by the module)
Short Circuit Current	15 ma±10% (Supplied by the module)
Transient Protection	5 msec ± 1 msec before detection of a transition
Surge Protection	SWC test on all customer terminals
Max Counting Rate	100 Transitions/Sec
Common Control Interface	
XMIT/REC Line Rate	9600, 4800, 2400, 1200, 600, 300, 150 BPS (2400 standard)
Power Input	
Voltage	115 VAC ±10%
Frequency	47-420 Hz
Power	21 VA
Physical	
Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	13 lbs.

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Rev. 6/81

SERIES 5000 50-0280

6-Point Raise/Lower Module

The 6-Point Raise/Lower module is designed for Energy Management and Process Control applications. In response to commands generated by a computer-centered Master station, it provides variable timed contact closures.

A single transmission, consisting of six characters, will actuate the selected point's Raise or Lower contacts for the duration specified in the transmission.

Customer Interface

Mechanical Interface: Two #6 screw terminals per point on barrier type terminal strips.

Output: Four form A dry contact outputs (two Raise and two Lower) per point with the following ratings:

Open Circuit Voltage	Current (Resistive Load) Max.	Min.
28 VDC	2 A	1 ma
52 VDC	0.7 A	1 ma
140 VDC	0.2A	1 ma
120 VAC 60 Hz	2 A	1 ma

Handoff Duration: Raise: 0.1 to 1.5 sec., including 0 (no operate)
Lower: 0.1 to 1.6 sec., including 0 (no operate)
Variable in 0.1 sec. intervals (± 5%), as specified in command word individually for each point.

Surge Protection: SWC Test on all customer terminals

RS-232-C Interface

Xmit/Rec Line Rate: 9600, 4800, 2400, 1200, 600, 300, 150 bps (2400 standard)

Power Input

Voltage: 115 VAC ± 10%

Frequency: 47-420 Hz

Power: 25 VA

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(Continued)

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	13 lbs.

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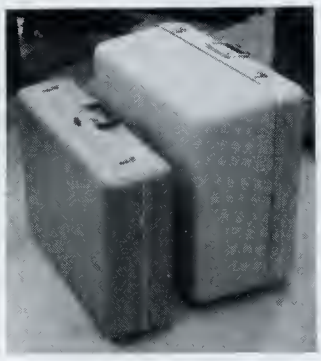
SERIES 5000 Simulator

50-0300



Series 5000 Simulator

Simulator Logic

I/O Terminal

The Microplex Series 5000 Simulator consists of two components: a Simulator I/O Terminal which serves as the man/machine interface, and a Simulator Logic Module. The Simulator I/O Terminal is an RS-232-C compatible thermal printer with keyboard, and the Logic module conforms to the Series 5000 modular concept. The two components are designed for portability. They provide a means of trouble-shooting and identifying any failed intelligent module in a Remote.

The Simulator Logic Module utilizes three RS-232-C ports. The I/O Terminal plugs into one of these, and the other two can be plugged into any port in a Remote. The Simulator can then transmit and receive any message sequence required to fully exercise any intelligent module. Each of the three ports is equipped with a selector switch covering a range of 150 to 4800 BPS.

Three 8-foot cables with connectors are provided with the Simulator.

The following table lists the machine response (boldface type) and the operator entry (underscored) for each Simulator command, together with explanatory comments:

Entry	Comments
M:LC	Lists the commands available to the operator (List Commands).
M:LV	Lists the names of all the variables. (List Variables)
M:LD **XMIT COUNT:**XXX **RCV COUNT:**XXX **DATA:**XXX **DATA:**XXX	Loads data into the transmitter-receiver buffer. (Load Data). Typing an "L" in a data field causes an LRC character to be calculated and entered.
M:TD	Types the data entered into the transmitter-receiver buffer. (Type Data)
M:TR	Transmits and/or Receives the messages set up by the LD command.
M:SV YY XXXXX	Set a variable to some value
M:TA	Types out the name and value of all variables.

(Continued)

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INTERFACE SPECIFICATIONS

RS-232-C Interfaces

Number of Ports	3 (including MMI port)
Xmit/Rec Line Rate	4800, 2400, 1200, 600, 300, 150 BPS (individually switch selectable).
Line Rate Tolerance	± 3%
RS-232-C Circuits Used	AB Signal Ground BA Transmitted Data BB Received Data CA Request to Send CB Clear to Send CC Data Set Ready CD Data Terminal Ready
Character Format	One start bit, seven data bits, with or without a parity bit (odd or even), and one stop bit.

Power Input

Voltage	115 VAC ± 10%
Frequency	47-63 Hz
Power	75 VA

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50-0303

SERIES 5000

Portable Communications Module

The Portable Communications module provides interface between an RS-232-C port and a 3002 voice-grade communication channel. The interface to the communication channel is Bell 202D compatible. The module may be utilized with the standard 5000/5500 Simulator (50-0300) for communicating with a remote over a communications channel.

Data rate is from 0-1200 BPS, using unconditioned (or better) lines. The module is capable of full duplex or half duplex operation, and can be operated with either a 2-wire or 4-wire channel. It provides a "Request to Send/Clear to Send" delay which is adjustable from 0 to 200 milliseconds to accommodate different channel turn-around times.

The Communications module operates from AC input power.

Communication Channel Interface

Line Requirements	3002 unconditioned for 0-1200 BPS
Modulation	Phase coherent FSK
Frequencies (Bell 202D Compatible)	Mark 1200 Hz ± 1.0% Space 2200 Hz ± 1.0%
Transmit Level	0 to −25 dbm, adjustable
Receive Dynamic Range	0 to −40 dbm
Impedance	600 ohms ± 10%, resistive
Mechanical Interface	Six #6 screw terminals on barrier type terminal strip. (Two terminals plus shield for transmit and receive line.)
Surge Protection	SWC test on all customer terminals

RS-232-C Interface

Xmit/Rec Line Rate	0-1200 BPS
Request to Send/Clear to Send Delay	20 to 200 msec adjustable (± 10%)

Power Input

Voltage	115 VAC ± 10%
Frequency	47-420 Hz
Power	6 VA

Physical

Length	19.2 in.
Width	15.25 in.
Height	7.13 in.
Weight	22 lbs.

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1-81

SERIES 5000

50-0310 Transducer Mounting Assembly

The transducer mounting assembly provides mounting space for six transducers. Wiring and transducer implementation is per customer requirements.

Outside Dimensions

Panel Width	19″ rack mount as specified in EIA-RS-310-A
Vertical Panel Space	12-1/4 inches

Internal Mounting

Mounting holes for all standard transducers (Watt, Var, Volt, Amp, and Frequency).

Terminal Blocks Available:

- Buchanan B112
- States Co. Slidelink "NT" Series
- Superior Co. Knife Switch with shorting option.

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Rev. 9/76

SERIES 5000 50-0320

Reclosure Blocking Module

The Reclosure Blocking module is intended to satisfy custom reclosure blocking requirements. The operation of the module is per specific customer requirements and all necessary special wiring is included. This module provides a means of performing a reclosure blocking output to inhibit the automatic reclosure of a customer's circuit breaker when a Trip command is performed from the master station. Each assembly will provide the reclosure blocking circuitry for eight points. It is designed to be driven from a Control Relay module.

The power supply included in the module is of sufficient capacity to energize at least one Hart relay and one KUL relay at a time.

Customer Interface

Mechanical Interface	Eight #6 screw terminals on barrier type terminal strips
Output	Two Hart WU Relays and one Potter Brumfield KUL relay per point wired per customer specifications. Voltage and current rating depends upon wiring configuration.

Control Relay Input Interface

Mechanical Interface	Two #6 screw terminals per point (one trip and one close) plus one common.
Electrical Interface	Two contact closures per point (one trip and one close)
Open Circuit Voltage	24 VDC } provided by module
Short Circuit Current	200 ma (max) } provided by module

Physical

Width	19 in. (rack mounting; EIA-RS-310-A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	12 lbs.

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Rev. 9/76

SERIES 5000

50-0330
AC Distribution

The AC Distribution module is implemented in the Series 5000 remote in applications where AC power is available for remote station operation.

AC POWER INPUT

Mechanical Interface	Three #8 screw terminals on barrier type terminal strip.
Fuse Protection	One AC circuit breaker on AC input.

PHYSICAL

Width	19 in. (rack mounting: E1A-RS-310A)
Vertical Panel Space	14 in.
Depth	6-1/2 in.
Weight	8 lbs.

ENVIRONMENTAL

Operating Temp. Range	0°-55° C ambient
Relative Humidity	0%-95%, non-condensing

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SERIES 5000 50-0400 Freestanding Rack

The Freestanding Rack is designed to mount Microplex Series 5000 modules. Provision is made to mount modules on either side of the rack.

One 50-0400 Rack accommodates a maximum of 10 Series 5000 modules (5 14-inch modules on each side).

RS-310-A Mounting Surfaces

Panel Width	19″ as specified in EIA RS-310-A
Vertical Panel Space	41 units as specified in EIA RS-310-A (≈ 72 inches)

Overall Dimensions

Height	78″
Width	24″
Depth	24″
Weight	35 lbs.

Color

Charcoal Black, Sherwin Williams Polane T or equivalent.

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Rev. 9/76

Connections:
3-wire (neutral, ground, voltage); male 3-prong connector on outside of each module

Protection:
Single fuse on ac input

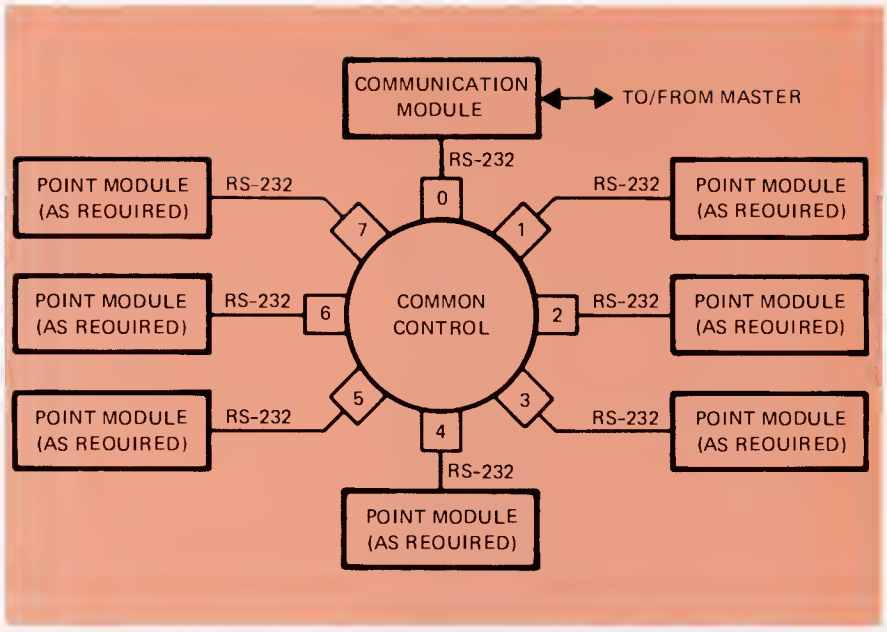
Power Supply:
Each power supply internal to a functional module is rated at a minimum of 125 percent of maximum load over te temperature range inside the enclosure. Minimum efficiency of each power supply is 50 percent at maximum load.

Grounding

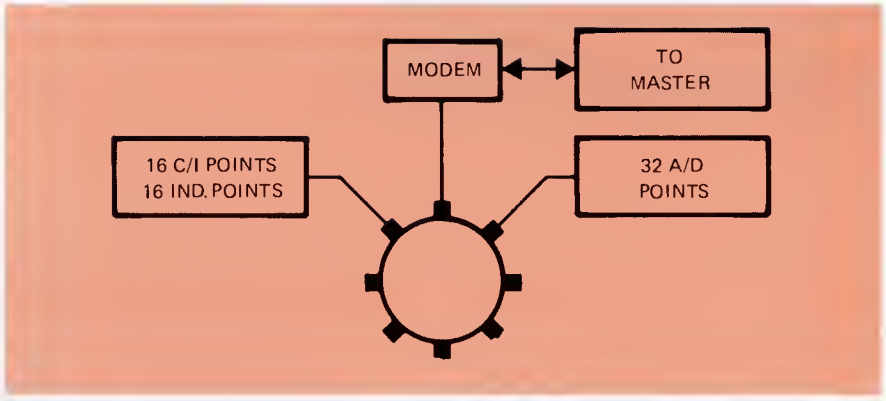
All noncurrent carrying, normally exposed metal parts of all modules are grounded. The common ground is provided to the customer as "Earth Ground" on the metal enclosure of the Power Supply module, if supplied. Otherwise, Earth Ground is provided at each metal module enclosure intended for separate installation by the customer. The neutral lead is not normally connected to Earth Ground, but provision for such connection is made at the Power Supply module. Protective Ground as described in RS-232-C is electrically connected to the Common Control module.

Module Enclosures

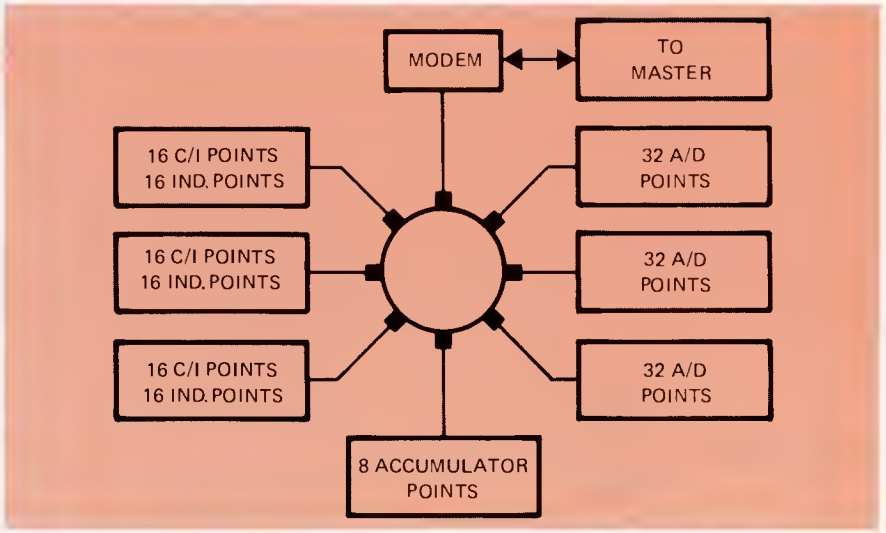
Each functional module is self-contained in a NEMA Type-1 enclosure suitable for indoor industrial use. Each module is packaged to require front access only for all servicing and replacement of components. Any electrical component can be replaced without disturbing customer wiring. All modules are for 19 inch rack mounting as specified in EIA RS-310-A. Modules are typically 14 inches high, 6½ inches deep.



Series 5000 Common Control interconnects with other modules through standard data ports (0–7 in diagram).



Typical 64-point Series 5000 Remote with capability for five additional modules.



Expansion of same Remote to larger configuration.

Common Control logic circuitry is contained on one printed circuit board for simplified maintenance.

Maintenance

Component layout and packaging have been carefully planned to facilitate installation, interconnection with controlled devices, and maintenance. All logic within a module is on one flow-soldered PC board . . . which can be changed in a matter of minutes. Each module contains power supply circuitry in a door-mounted compartment; and all terminals for wiring to customer devices are in a separately partitioned area. This design has eliminated all wire wrap, card edge connectors, hand wiring, and the bulky, cumbersome cables usually associated with remote station equipment.

The only specialized test equipment required is a 50-0300 RS-232-C Simulator. The simulator plugs into any data port in the Remote, and can generate and respond to all message sequences in the system.

Environment

Series 5000 modules are designed for operation in ambient temperatures of 0°C to 55°C, and 0% to 95% Relative Humidity (non-condensing). The modules will withstand storage (non-operating) temperatures of −25°C to 80°C. They are designed for shipment by commercial electronics van.

MICROPLEX® Series 5000 Remote Station Modules

Catalog #	Description
50-0200	8-Port Common Control
50-0210	1200-Band FSK Communication Module
50-0200	300 VA Power Supply, 125 Vdc In
50-0221	300 VA Power Supply, 48 Vdc In
50-0222	300 VA Power Supply, 24 Vdc In
50-0230	16-Point C & I, 16-Point Indication
50-0235	16-Point C & I, 16-Point Indication, Sequence of Events
50-0240	16-Point Control Relay, (for 50-0230)
50-0241	Heavy Duty Interposer Assy. — 8-Point
50-0242	Extension Heavy Duty Interposer — 8-Point
50-0250	32-Point A/D (Single Ended)
50-0251	32-Point A/D (Isolated) with Reference
50-0252	32-Point A/D (Single Ended) with Reference
50-0255	32-Point Low Level Analog Amplifier
50-0260	4-Point Setpoint Module
50-0270	8-Point Accumulator Module
50-0280	6-Point Raise/Lower Module
50-0300	RS-232-C Simulator
50-0310	Transducer Mounting Assembly
50-0320	Reclosure Blocking Assembly
50-0330	AC Distribution Assembly
50-0400	Free-Standing Rack

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